

Public Review Comment Metric

Originating Office: AIR-130	Document Description: TSO-C43d Temperature Instruments	Project Lead/Reviewer Veronica Gardner	Reviewing Office:	Date of Review:
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	Commenter	Section # and Page #	Comment	Suggested Change and Rationale	Disposition
1.	Garmin	Section 3, page 1; Section 3.c, page 2; and Section 3.d, page 2	Reference is made to “Appendix 1”, but the Appendix title on page 7 is “Appendix A”.	Correct reference to Appendix.	Accepted.
2.	Garmin	Section 3.b. Page 1	Section 3.b. specifies the failure condition classification for loss of and erroneous operation as major. Temperature instruments may be utilized for a wide variety of indications within the aircraft. Designing equipment to meet the requirements of major failure conditions may be unreasonable if the instrument is not intended to be used for temperature indications necessary for safe operation of the aircraft. For example, baggage compartment temperature is much less critical than outside air temperature and should be allowed to be designed as such.	Utilize the alternate failure condition classification text in the TSO Template in Order 8150.1C: “There is no standard minimum failure condition classification for this TSO. The failure condition classification appropriate for the equipment will depend on the intended use of the equipment in a specific aircraft. Document the loss of function and malfunction failure condition classification for which the equipment is designed.”	Accepted.
3.	Garmin	Section 3.d. Page 2 and Appendix A (iii) Page A-1	Section 3.d. states: Demonstrate the required performance under the test procedures in appendix 1(iii) of this TSO using standard	Garmin recognizes the reference to DO-138 in SAE AS 8005A does not allow a direct utilization of the template text in Order 8150.1C, however the following suggested text utilizes a combination of the two options. If the vibration tests of	Accepted.

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			<p>environmental conditions and test procedures appropriate for airborne equipment.</p> <p>Garmin believes this section:</p> <ol style="list-style-type: none"> 1) Unnecessarily refers to another section within the document to specify the environmental standard. The statement in Appendix A(iii) could be stated in 3.d. The reference to an appendix as found in the TSO Template in Order 8150.1C is typically used when the appendix specifies specific test equipment / procedures applicable to the equipment, not a general reference to DO-160(). The requirement to use DO-160G could be stated directly in section 3.d. 2) Does not refer to Appendix A(ii) which would be expected due to Appendix A(ii) requiring a specific environmental test procedure. The standard reference to 	<p>DO-160G or later must be used, suggest specifying this requirement in this paragraph as well.</p> <p>Demonstrate the required performance under the test conditions specified in section 5 of SAE AS 8005A using RTCA/DO-160G. You may use a different standard environmental condition and test procedure than RTCA/DO-160G, provided the standard is appropriate for the airspeed instrument.</p> <p>Note: The use of RTCA/DO-160D (with Changes 1 and 2 only, incorporated) or earlier versions is generally not considered appropriate and will require substantiation via the deviation process as discussed in paragraph 3.g of this TSO.</p>	

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			<p>Appendix A in section 3. does not clearly modify the requirements of the environmental test procedures as section 3. defines the functional requirements of the appliance, not the test procedures.</p> <p>3) Does not follow the TSO Template in Order 8150.1C which allows for the use of other revisions of DO-160() by the text (emphasis added):</p> <ul style="list-style-type: none"> a. “standard environmental conditions and test procedures appropriate for airborne equipment” or b. “You may use a different standard environmental condition and test procedure ... provided the standard is appropriate ...” 		

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4.	Garmin	Section 3.e. Page 2	<p>Section 3.e. states:</p> <p>“...to the software level consistent with the failure condition classification defined in paragraph 3.b of this TSO.”</p> <p>The TSO Template in Order 8150.1C states the following (emphasis added):</p> <p>“... to at least the software level consistent with the failure condition classification defined in paragraph 3.b of this TSO.”</p> <p>The text is inconsistent with Order 8150.1C.</p>	Update section 3.e. to include the text “at least” to be consistent with the TSO Template in Order 8150.1C.	Accepted.
5.	Garmin	Section 3.f. Page 2	<p>Section 3.f. states:</p> <p>“... to the design assurance level consistent with the failure condition classification defined in paragraph 3.b of this TSO.”</p> <p>The TSO Template in Order 8150.1C states the following (emphasis added):</p>	Update section 3.f. to include the text “at least” to be consistent with the TSO Template in Order 8150.1C.	Accepted.

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			<p>“... to at least the design assurance level consistent with the failure condition classification defined in paragraph 3.b of this TSO.”</p> <p>The text is inconsistent with Order 8150.1C.</p>		
6.	Garmin	Section 3.f. Page 2	<p>Including this specific DO-254 reference is redundant to the rest of the paragraph in this section.</p> <p>For custom airborne electronic hardware determined to be simple, RTCA/DO-254, paragraph 1.6 applies.</p> <p>DO-254 makes it clear how to address “simple” custom airborne electronic hardware.</p>	Remove this reference to DO-254 Paragraph 1.6.	<p>Not Accepted.</p> <p>TSO-43d follows the template language of Order 8150.1C CHG2. Comment will be forwarded to AIR-111 for review.</p>
7.	Garmin	Section 4.b.(2) Page 3	<p>Paragraph 4.b.(2) states:</p> <p style="padding-left: 40px;">Each subassembly of the article that you determined may be interchangeable.</p> <p>This language is confusing.</p>	<p>The language for this requirement is confusing. This could mean that a stuffed printed circuit board needs the TSO number.</p> <p>Suggest removing the statement or if removing causes problems, work with industry to establish wording that is better understood.</p>	<p>Not Accepted.</p> <p>TSO-43d follows the template language of Order 8150.1C CHG2. Comment will be forwarded to AIR-111 for review.</p>

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8.	Garmin	Section 5.b. Page 4	<p>Section 5.b states (emphasis added):</p> <p>“b. Instructions covering periodic maintenance, calibration, and repair, to ensure that the temperature instruments continue to meet the TSO approved design.”</p> <p>The TSO Template in Order 8150.1C states the following (emphasis added):</p> <p>“b. Instructions covering periodic maintenance, calibration, and repair, for the continued airworthiness of {insert type of equipment.}”</p> <p>The text is inconsistent with Order 8150.1C.</p>	Update section 5.b. to include text “for the continued airworthiness of the temperature instruments.” to be consistent with the TSO Template in Order 8150.1C.	Accepted.
9.	Garmin	Section 5.f. Page 4	TSO paragraph 5.f and its subparagraphs include definition of non-TSO functions and the data to be submitted to the ACO for non-TSO functions. This guidance is inconsistent with Order 8110.4C CHG 4.	TSO paragraph 5.f states “Identify functionality or performance contained in the article not evaluated under paragraph 3 of this TSO (that is, non-TSO functions).” Use of the term “performance” in the definition of a non-TSO function is inconsistent with	Not Accepted. TSO-43d follows the template language of Order 8150.1C CHG2. Comment will be forwarded to AIR-111 for review.

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				the Order 8110.4C CHG 4 paragraph 6-9.b.(1) and 6-9.b.(3)(a) guidance regarding how to define a non-TSO function. The issue is non-TSO should not be defined as “performance”. It will create difficulty if these criteria are used. For example, if a TSO requires a minimum 10 watt transmitter and a company makes equipment that is robust at 11 watts, the performance exceeding the TSO is not called out under the TSO; consequently, by the paragraph 5.f “performance” definition, the 11 watt transmitter has a non-TSO 1 watt capability. The distinction of a “function that can be accomplished outside the TSO box” as is specified in Order 8110.4C CHG 4 paragraph 6-9 is critical to making non-TSO function work long term.	
10.	Garmin	Section 7.b. Page 6	TSO paragraph 7.b contains wording that is inconsistent with Order 8110.4C CHG 5.	TSO paragraph 7.b includes additional guidance about what furnished data should be provided to an operator or repair station when the equipment includes a non-TSO function. The problematic guidance states “include one copy of the data in paragraphs	Not Accepted. TSO-43d follows the template language of Order 8150.1C CHG2. Comment will be forwarded to AIR-111 for review.

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				5.f.(1) through 5.f.(4).” This guidance is inconsistent with Order 8110.4C CHG 5. Order 8110.4C CHG 5 paragraph 6-9.b.(6) defines the FAA-industry agreed data that must be provided to an installer when equipment includes a non-TSO function.	
11.	Rockwell Collins	3	The opening paragraph states, “ New models of temperature instruments identified and manufactured on or after the effective date of this TSO must meet the MPS qualification and documentation requirements in Society of Automotive Engineers, Inc. (SAE) Aerospace Standard (AS) 8005, “Minimum Performance Standard for Temperature Instruments”, Revision A, September 1996, as modified by Appendix 1 of this TSO.” The cross-reference to Appendix 1 is an apparent typographical error. The correct cross-reference should be ‘Appendix A’ as shown on page A-1 of the TSO.	Please correct typographical error in the cross-reference to the appendix of the TSO.	Accepted.
12.	Rockwell Collins	3c.	The Functional Qualification requirement for a TSO article usually pertains to a demonstration of the required functional performance of the	For specificity sake, consider rephrasing the requirement to read something to the effect, ‘Demonstrate the required functional performance under the test	Partially Accepted. Revised TSO to, “Demonstrate the required

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			equipment under standard conditions as defined in the applicable MPS invoked by the TSO but not under environmental conditions. Also, the cross-reference to Appendix 1 (iii) does not apply to the Functional Qualification requirement where compliance is to be shown under standard conditions only.	conditions specified in section 4 of SAE AS8005 as modified by Appendix A (i) of the TSO.'	functional performance under the test conditions specified in section 4 of SAE AS8005 as modified by Appendix 1 of this TSO."
13.	Rockwell Collins	3d.	The Environmental Qualification requirement states, "Demonstrate the required performance under the test procedures in appendix 1(iii) of this TSO using standard environmental conditions and test procedures appropriate for airborne equipment." The cross-reference to appendix 1(iii) is an apparent typographical error. The correct cross-reference should be 'appendix A(iii)' as shown on page A-1 of the TSO.	Please correct typographical error in the cross-reference to the appendix of the TSO.	Partially Accepted. Typographical error in cross-reference to Appendix has been corrected. However, section 3d. of this TSO was revised to "Demonstrate the required performance under the test conditions specified in section 5 of SAE AS 8005A using RTCA/DO-160G. You may use a different standard environmental condition and test procedure than

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					<p>RTCA/DO-160G, provided the standard is appropriate for the airspeed instrument.</p> <p>Note: The use of RTCA/DO-160D (with Changes 1 and 2 only, incorporated) or earlier versions is generally not considered appropriate and will require substantiation via the deviation process as discussed in paragraph 3.g of this TSO.”</p>
14.	Rockwell Collins	Appendix A	Paragraph (iii) in Appendix A of the TSO states, “Conduct all test requirements of SAE AS8005A to RTCA/DO-160G.”	For specificity sake, consider inserting a reference to the minimum performance standards under environmental conditions section of the MPS. For example, rephrase the requirement to read something to the effect, ‘Conduct all test requirements in section 5 of SAE AS8005A to RTCA/DO-160G.’	Accepted.
15.	K Lenger	§3 Pg 1 §3.c, 3.d	Refers to Appendix 1 but the appendix is marked as Appendix A	Harmonize the appendix reference	Accepted.
16.	K Lenger	Appendix A	(iii) makes no allowance for DO-160 revisions before DO-160G	Consider allowing DO-160D Change 3 or later as allowed in most other	Accepted.

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				modernized TSOs. (TSO-C146d)	Note: Appendix 1 (iii) was removed and allowance for other DO-160 revisions before DO-160G is incorporated under environmental conditions of this TSO.
17.					
18.					
19.					